



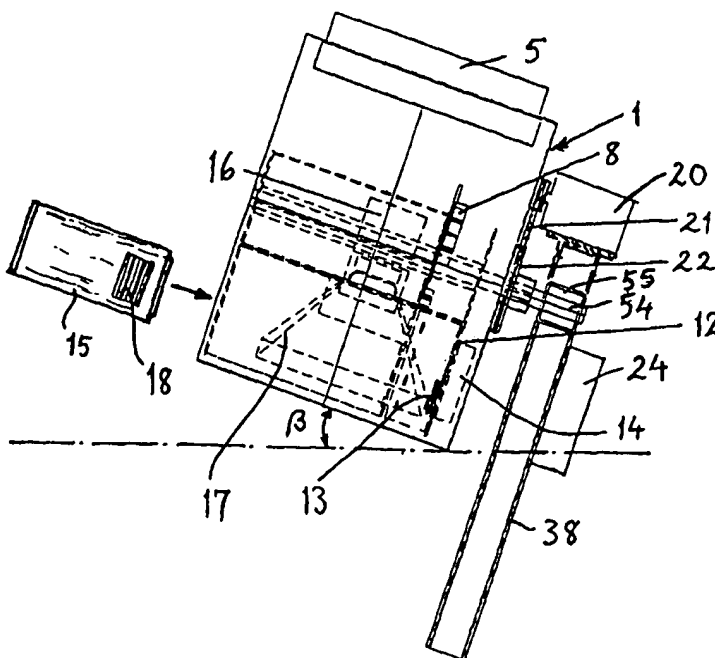
## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(54) Title: A DEVICE FOR HANDLING EMPTY BEVERAGE CONTAINERS

## (57) Abstract

A reverse vending apparatus for empty containers (15), e.g., bottles or cans, comprising an inclined rotatable drum (1), a controllable driving means (20-22) for rotating the drum, a stationary unit (10) for receiving and holding a container (15), when rotated by a drum wall (12), means (13; 14, 16) on said unit (10) for detecting characteristic container features, a central control unit (24) for determining distance and direction of rotation of the drum (1), at least one open drum wall portion (3; 4; 56) to form an open bottom in said unit (10, 11), upon rotation of the drum to exit the container (15) therefrom, a guiding means (5; 6; 57; 58) positioned at said open drum wall portion, and at least one container collecting means (36; 37; 59) positioned below said unit bottom. A container destruction device (8; 9; 8, 38; 9, 39) secured to the drum wall (2) can, when the drum rotates, penetrate into said unit (10).



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## A DEVICE FOR HANDLING EMPTY BEVERAGE CONTAINERS

The present invention relates to a reverse vending apparatus for empty containers of an  
5 essentially circular cross section, e.g., bottles or cans, wherein the reverse vending  
apparatus is designed to detect characteristic features of the containers, and also to sort  
received and detected containers.

WO 93/25981 (PCT/NO93/00091) makes known an apparatus for handling empty  
10 beverage containers, which comprises a rotatable drum device of the revolver type  
having a stationary outer wall and bottom, and a rotatable part provided with a plurality  
of container receiving chambers, and means for turning the rotatable part, characteristic  
features of the containers being detected during the rotation of the rotatable part. Means  
are provided for selectively discharging a container at a suitable outlet located in the  
15 outer wall or the bottom of the stationary part on the basis of detected insignia. The  
container is thus conveyed along the outer wall until it reaches the outlet in the  
stationary drum part from where it is to be released. Furthermore, there are means for  
destroying the containers by shattering them.

20 Technically, the known solution is somewhat complex, and consequently it has been an  
object of the present invention to provide an apparatus which is simpler in structure and  
which permits initial sorting of received and detected containers, and optionally a pre-  
compacting thereof.

25 The characteristic features of the invention will be set forth in the patent claims below  
and in the following description with reference to the attached drawings.

Fig. 1 is a perspective view of the apparatus according to the invention.

30 Fig. 2 is a side view of the apparatus in Fig. 1.

Fig. 3 is a front view, seen at an angle relative to the horizontal of the apparatus shown  
in Figs. 1 and 2.

35 Fig. 4 shows the apparatus according to Fig. 3 in a first operational position.

Fig. 5 shows the apparatus as shown in Fig. 3 in a second operational position.

Fig. 6 shows the apparatus as shown in Fig. 3 in a third operational position.

Fig. 7 shows the apparatus as shown in Fig. 3 in a fourth operational position.

5

Fig. 8 shows a modified version of the apparatus as shown in Fig. 3.

Fig. 9 shows another modified version of the apparatus as shown in Fig. 3.

10 Figs. 10-12 are respectively a perspective view, a side view and a front view of yet another modification of the apparatus as shown in Figs. 1, 2 and 3 respectively.

Fig. 13 shows a simplified circuit diagram for electric/electronic units included in the apparatus according to the invention.

15

Figs. 14 and 15 show a modification of the apparatus, shown in Figs. 3 and 7 respectively.

20 Figs 16 and 17 show a modification of the apparatus which is shown in Figs. 8 and 9 respectively.

Fig. 18 shows a modification of the apparatus which is shown in Fig. 2.

Fig. 19 is a modification of the apparatus shown in Fig. 13.

25

The various parts included in the apparatus will be described briefly, with reference primarily to Figs. 1-3. The apparatus consists of a drum 1 having a wall 2 which serves in part to support and in part to discharge containers, two open portions 3, 4 in the drum wall 2 serving as discharge and sorting holes for containers which are to be discharged.

30 In connection with the open portions 3 and 4, a respective guide plate 5, 6 is provided to ensure that a discharged container ends up on the right side (A or B) of a sorting wall 7. Destruction mechanisms 8, 9, preferably in the form of guillotine blades, are secured to the drum wall 2.

35 The drum 1 contains a receiving and holding unit 10 having a chamber 11 for receiving and holding inserted containers, such as bottles or cans. A material sensor 13, e.g., a metal detector, is preferably located at the end wall 12 of the holder unit 10 and

chamber 11. To prevent any attempts to have full containers destroyed by the apparatus, a "full-container" sensor 14 is also located at said end wall 12. A full container 15 will exert pressure on the end wall 12, and if the sensor 14 is a weighing instrument, it may, e.g., be made in the form of a pressure-sensitive sensor, wherein the end wall 12, at least with a part thereof, will be able to form a pressure plate for the sensor 14. Thus, it is possible with the aid of the material detector 13 to carry out detection of the material of the container, and with the aid of the sensor 14 to determine whether the container contains any liquid to speak of. The material detection may consist of, e.g., deciding whether the container is made of steel, aluminium or plastic, whilst the sensor 14 determines whether the container is too heavy in comparison with the standard based on the other detected features.

In addition, in the receiving and holding unit 10, preferably in an upper portion thereof, there is located a bar code reader 16 having a field of view 17 which allows it to read a bar code 18 on the can 15 when the can is put into the receiving and holding chamber 11 via an insertion opening 19. The chamber 11 is limited in size by the drum wall 2, the side walls 30, 32, the upper side 33 and the back wall 12 which form parts of the receiving and holding unit 10. The insertion opening 19 is thus also defined. When the user or the customer places the container of circular cross section in the chamber 11, the drum 1 is, as mentioned, in the position defined by the arrow 23 in relation to the marker 2'. Since the drum has an angle of inclination  $\beta$  relative to the horizontal, preferably in the range of  $10^{\circ}$ - $75^{\circ}$ , and more preferably in the range of  $10^{\circ}$ - $40^{\circ}$ , the container will slide down along the inside of the drum wall 2 with its bottom resting against the wall 12.

However, sometimes the bar code area 18 on the container 15 may face away from the field of view 17. Consequently, to be able to detect the bar code area 18, the container 15 must be rotated so that the bar code area 18 comes into the field of view 17 of the bar code reader 16. To this end, the drum 1 is caused to rotate by means of a motor 20 via a transmission 21, e.g., a driving belt and a driving pulley 22. The direction in which the drum 1 is caused to move is controlled by the choice of the side of the sorting wall 7 on which it is desirable for the container to end up. Furthermore, the direction of rotation may be given by the desired manner of destruction, whether destruction is not desired or whether it is desirable to return the container to the user or customer.

The drum 1 and the wall 2 thereof have a starting position indicated by the marker 2' on the drum and the arrow 23. From this starting position, the drum is moved through an

angle  $\alpha$ , as is shown in Fig. 4. The angle  $\alpha$  is preferably in the range of  $20^\circ$ -  $120^\circ$ , but more preferably in the range of  $45^\circ$ - $75^\circ$ . During this movement, the drum wall 2 on which the container 15 rests, and which thus forms the bottom of the receiving and holding chamber 11, will move, thereby causing the container 15 having an essentially  
5 circular cross section to rotate so that the bar code area 18 will gradually come into the field of view 17 of the bar code reader 16.

The material detector 13, the sensor 14 and the bar code reader 16 are connected to an electronic computing and control unit 24, for example, a microprocessor.

10

A closure flap 25 is provided to prevent access to the chamber 11 of the receiving and holding unit whilst the drum 1 is in motion. The flap 25 may optionally interact with a flap motion sensor 26, so that if an attempt is made to open the flap 25 whilst the drum is in motion, the drum will stop immediately. Alternatively, the flap 25 may in addition  
15 or instead interact with a flap interlock mechanism 27, as indicated on Fig. 3, thereby preventing manipulation of the flap 25 whilst the drum 1 is in motion.

If the sensor 14 registers that the container is full and thus should not be handled by the reverse vending apparatus, but be taken back by the customer responsible for the  
20 insertion of the container, the customer may be informed via a message display 28 that he should retrieve the container via a display 28, as indicated in Fig. 13. Return of the container to the customer may also be necessary because the bar code 18 is either missing or unreadable, or because the bar code 18 indicates that the container is non-returnable in the reverse vending apparatus, and in that case the customer will be  
25 informed via the display 28 that he must remove the container from the chamber 11. In these instances, the drum 1 is returned to the position shown in Fig. 3 by means of the motor 20.

As a supplement or an alternative to the said system for return of the container, an  
30 embodiment for the automatic return of non-acceptable containers to the user or customer is described below in connection with Figs. 10-12 and also Fig. 13.

If the material detector 13 accepts the container, e.g., a plastic or aluminium container, and the bar code reader 16, via its field of view 17, recognises the container on account  
35 of its bar code and thus can accord the container a possible return deposit value, the drum 1 will be caused either to continue to turn in a clockwise direction as shown in Fig. 4, or to turn in an anticlockwise direction as shown in Fig. 5. On rotation in a

clockwise direction, the destruction mechanism 8, in this case resembling a guillotine blade, will penetrate in through a slot 29 in the wall 30 of the receiving and holding unit and then pass out through another slot 31 in the opposite wall 32. The container 15 is thus first struck by the point 8' of the knife blade and pressed against the wall 32. As  
5 the drum 1 continues to move, the container is cut through completely by the destruction mechanism 8. When the destruction mechanism 8 has moved past the receiving and holding chamber 11, the open portion 3 in the drum wall 2 will enter the position shown in Fig. 6, and in so doing will cause the bottom of the chamber 11 to be open. The container 15, which has now been split in two, will consequently fall out of  
10 the chamber and by means of the guide plate 5 will be caused to land on side A of the sorting wall 7.

Similarly, when rotating in an anti-clockwise direction, the drum 1 will cause the destruction mechanism 9 to enter the chamber 11 first via the slot 31 and then pass out  
15 through the side wall 30 via the slot 29. As shown in Fig. 5, the container 15 is then first struck by the point 9' of the destruction mechanism 9, the mechanism in this case too being made in the form of a guillotine blade. The container 15 is thus pressed against the wall 30 and cut through by the guillotine blade 9, whereby the container 15 is split in two. When the drum 1 is turned further, the open portion 4 in the drum wall 2  
20 will be found under the chamber 11, and in so doing will in fact cause the bottom of the chamber 11 to be open, so that the destroyed, split container 15, with the aid of the guide plate 6, is caused to end up on side B of the sorting wall 7. Thus, containers of a certain type or group of types can be sorted to side A of the sorting wall 7, whilst containers of another type or type group are caused to end up on side B. The control of  
25 the direction of rotation of the motor 20 is effected by the computing and control unit 24 on the basis of the signal values received from the material detector 13, the sensor 14 and the bar code reader 16.

For instance, it will be appropriate to sort metal cans from plastic bottles. In such a  
30 case, the metal cans will be rotated in the opposite way to the plastic bottles and owing to friction against the inside of the wall 2, the container also rotates, the receiving and holding unit 10 being stationary relative to the rotatable drum 1. Depending on the diameter of the container, the bar code on the container will be read one or more times by the time the drum 1 has rotated through reading angle  $\alpha$ .

35

On the basis of detected features, in particular the bar code, of a container, the computing and control unit 24 will compute the return deposit value, if any, of the

container on the basis of prestored data, e.g., entered from an input unit, e.g., a keyboard, a data medium reader or the like.

If the detected container has a return deposit value, accumulated return deposit value  
5 due will either be paid directly from a payment unit 35 or the customer will receive a proof of return deposit value from the payment unit in the form of a printer as indicated in Fig. 13.

Fig. 8 shows a modified version of the apparatus according to the invention, wherein  
10 only one destruction mechanism 9 is provided. This means that containers which are not to be destroyed or deformed are fed out through the open portion 3 of the drum wall 2 to side A of the sorting wall 7, whilst destroyed containers only are fed to side B of the wall 7. This solution may be appropriate in those cases where containers of a certain type or group of types are to be reused.

15 As can be seen by studying the drawings, the destruction mechanisms 8, 9 will move in a circular motion relative to the unit 10. After destruction with the aid of one or the other of the mechanisms 8, 9, the destroyed container will be discharged on one side or the other of the sorting wall 7 as described in more detail above.

20 Fig. 9 shows another variant of the apparatus according to the invention, wherein the destruction mechanisms 8, 9 have been removed from the drum wall 2 and wherein a container 15, after detection of characteristic features as shown and described in connection with Fig. 4, is discharged through the open portion 3 or 4 in order to end up  
25 on side A or side B of the sorting wall 7 in a respective receiving unit 36 or 37, which may either be a receptacle or a compacting apparatus or destruction apparatus with optional associated receptacle.

After a container has been discharged, whether it has been destroyed or not, the drum,  
30 under control of the unit 24, will after a brief standstill be returned to the starting position as shown in Fig. 3 with the aid of the motor 20, and the reverse vending apparatus is then ready once more to receive further containers that are to be processed.

In the solution which can be seen in Figs. 10-12, there are two pairs of destruction  
35 mechanisms, indicated by the reference numerals 8, 38 and 9, 39 respectively. These mechanisms are preferably made in the form of guillotine blades and have a mode of operation like that described above in connection with the mechanisms 8 and 9. The



wall 30 is equipped with an additional slot 40 and the wall 32 is equipped with an additional slot 41, so that the destruction mechanisms 38, 39 can pass through these slots when they penetrate and split the container located in the chamber 11. In addition, the unit 10 in an upper portion thereof must have a slot 42 through which the destruction  
5 mechanism 38 can pass. It will be appreciated that the use of paired destruction blades 8, 38 and 9, 39 will permit the efficient destruction of a container by it being split into three.

If a container is not acceptable, it can - as shown in Figs. 10-12 - be physically returned  
10 to the user or customer by being passed to a receiving chamber 43' located on the front of the cabinet 43 of the reverse vending apparatus.

Made in the drum wall 2 is a container-return opening 44 which is closed by a spring-loaded flap 45 that is hinged at the rear edge of the flap and the drum. As shown in  
15 Figs. 10 and 12, the opening 44 and the cover 45 are located adjacent to the destruction mechanisms 8, 38 and on the opposite side thereof relative to the open portion 3 in the drum wall 2. When, on the movement indicated in Fig. 4, the container is determined to be non-acceptable, the flap 45, which lies directly above the wall 7 when the movement ceases, will be opened thereby allowing the container to slide out on the cross-  
20 sectionally slightly curved, downward and forward sloping flap 45, and thence down into the receiving chamber 43'.

To overcome the spring force from the springs 46, 46' an angular portion 47 facing backward relative to the longitudinal axis of the flap 45 is actuated by a push rod 48' in  
25 a pusher mechanism 48, e.g., solenoid-based or motor-operated. The mechanism 48 is controlled from the computing and control unit 24. The pusher mechanism 48 will thus only function if a) a container is to be returned to the user or customer, and b) the opening 44 with associated flap 45 is in a lower position immediately above the sorting wall 7, as shown in Figs. 11 and 12. It is an advantage if the portion 47 has a somewhat  
30 concave configuration in order to provide a better rest for the free end of the push rod 48'. Furthermore, and as shown in Figs. 10 and 11, the upper edge of the sorting wall 7 must form an angle  $\gamma$  with the drum wall 2, thereby enabling the flap 45 to assume a downward inclination relative to the horizontal in order to conduct a container out of the reverse vending apparatus and down into the chamber 43'. The angle  $\gamma$  may, for  
35 example, be in the range of  $30^{\circ}$ - $90^{\circ}$ , although this range should not be perceived as limiting with respect to the invention. Although the drawings show springs 46, 46', it

will be appreciated that other spring resistance mechanisms may be provided, e.g., the use of springs integrated in the hinge 52 or gas spring.

Simultaneously with the operation of the pusher mechanism 48, a cover 49 in front of a  
5 outlet opening 50 in the cabinet can be moved either by being pushed to the side by the  
container, or alternatively by being moved with the aid of a motor 51 controlled by the  
computing and control unit 24 in order to clear a passage for the returned container 15.  
After the container has descended into the chamber 43', the motor 51 moves the cover  
back in front of the opening 50, whilst the pusher mechanism 48 withdraws, so that the  
10 flap 45 flips back into place by means of the said spring force, thereby covering the  
opening 44.

The sorting wall 7, a wall 7' transverse thereto, the motor 20, the electronic computing  
and control unit 24, and the pusher mechanism 48 may all be mounted on a common  
15 framework 53, although the unit 24 may, for example, optionally be mounted on a  
cabinet 43 which encases the apparatus shown in the drawings. Similarly, the drum 1  
will be supported via its shaft 54 on the framework 53 via a bearing 55.

Figs. 14 and 15 show a modification of the discharge opening in the drum, wherein the  
20 opening has been made larger than the openings 3, 4 and in such manner that there is  
only one opening 56 which is defined by elastically yielding sweeping or guiding  
means, e.g., brushes or rubber plates 57, 58. Depending upon which way the drum 2  
turns, one of the guiding means will first sweep across the surface of a container catch  
trough 59 which lies partly across each of receptacles 36, 37. If, for example, the guide  
25 plate 57 first sweeps across the trough 59, the container 15 will then fall down into the  
trough 59. If the rotary motion of the drum 2 continues in an anti-clockwise direction,  
then the guiding means 58 will sweep across the surface of the trough and push the  
container 15 over the edge of the trough, so that it falls down into the receptacle 37.  
However, there is nothing to prevent the drum 2, after, e.g., the guide plate has passed  
30 the trough 59 and the container has fallen down therein, from changing its direction of  
rotation, so that the container is moved out of the trough by the guiding means 57 and  
down into the receptacle 36.

The catch trough 59 may either be positioned at the top of the container sorting wall 7 or  
35 quite simply fastened directly or indirectly to the framework 53. As indicated in Fig.  
15, the presence of the wall 7 is by no means a condition.

Figs. 16 and 17, which show a modification of the apparatus in Figs. 8 and 9 respectively, have the same mode of operation as the apparatus as described in connection with Figs. 14 and 15, and this will not be repeated.

- 5 Fig. 18 shows a modification of the solution shown in Fig. 2 and also represents an alternative solution to that shown in Figs. 11 and 12, viz., a solution for the return of a non-acceptable container to a customer with the aid of a carrier 60 which is secured to and can be moved to and fro in the chamber 11 with the aid of a conveyor 61, e.g., a belt conveyor driven by a motor 62. The conveyor 61 is mounted on the rotatable drum and  
10 only receives power supply via contacts 63 when the drum and its conveyor are immediately beneath the chamber 11. When the customer opens a barrier (not shown) and puts the container 15 in the chamber 11, the container will come to rest against the back wall of the chamber 11 and will then be examined as regards metal and optionally weight, as well as a possible bar code. If the bar code is not visible to the bar code  
15 reader, the container will be pushed out and returned to the customer by the carrier and conveyor, whereupon the customer may be informed that he should turn the container so as to render the code visible, after which the container is re-inserted into the chamber 11. The motor 62 may also be controlled from the microprocessor 24 (see Fig. 19).
- 20 Although the destruction devices 8 and 9 in Figs. 3 and 14 or 8, 38 and 9, 39 in Figs. 10-12 are positioned diametrically opposite one another in the drum 1, they may conceivably also be positioned closer to the respective open portions 3 and 4. As an example, the drawings illustrate the destruction or return of a can, but it should be understood that the apparatus is just as well suited for the task of handling bottles, in  
25 particular bottles made of a plastic material. Furthermore, the drawings show the use of the destruction mechanism in the form of one or two guillotine blades, but it should be understood that at least one additional guillotine blade may optionally be used in a destruction mechanism.

Patent claims

1.

5 A reverse vending apparatus for empty containers having an essentially circular cross section, e.g., bottles or cans, wherein the reverse vending apparatus is designed to detect characteristic features of the containers, and to sort received and detected containers, comprising

- a rotatable drum having a bottom portion and an inclined axis of rotation;
  - controllable drive means for rotating the drum in a desired direction; and
  - 10 - detecting means for detecting said features;
- characterised by
- a stationary receiving and holding unit for a received container, wherein the bottom the unit is formed by the wall of the drum in order to rotate the container in the receiving and holding unit by means of the rotation of the drum, the detecting means
  - 15 being positioned on the receiving and holding unit;
  - a central control unit which on the basis of the signal output of the detecting means determines the distance and direction of rotation of the drum;
  - at least one open portion in the drum wall designed to be made on rotation of the drum to form an open bottom in the receiving and holding unit, so as to release the container
  - 20 from the said receiving and holding unit, at least one guiding means being positioned at said open portion on the drum wall; and
  - at least one container collecting or catch means positioned under the bottom of the receiving and holding unit in spaced relation thereto.

25 2.

An apparatus as disclosed in claim 1, for additionally destroying received containers, characterised by at least one destruction means which is secured to the drum and extends inwards inside the drum, and which when the drum rotates penetrates into the receiving and holding unit in order to be brought into destructive contact with the

30 container.

3.

An apparatus as disclosed in claim 2, characterised in that the destruction means is secured to the circumferential wall of the drum and extends inwards inside the drum

35 towards the axis of rotation of the drum.

4.

An apparatus as disclosed in claim 2 or 3, characterised in that the destruction mechanism is made in the form of at least one guillotine blade.

5

5.

An apparatus as disclosed in claim 2 or 3, characterised in that the destruction means is designed to operate as a crushing device.

10 6.

An apparatus as disclosed in claim 1, characterised in that two open portions are provided in the drum wall, and that a guide plate provided as guiding means is positioned at each open portion on the drum wall.

15 7.

An apparatus as disclosed in claim 1 or 6, characterised in that an upright container sorting wall is positioned under the bottom of the receiving and holding unit in spaced relation thereto.

20 8.

An apparatus as disclosed in one or more of claims 1-7, characterised in that a trough is positioned at the upper region of the container sorting wall as said container catch means, and that said guiding means, e.g., in the form of a brush-like structure, is arranged to sweep across the surface of the trough when the drum rotates so as to move  
25 the container out of the trough and down into one of the receptacles.

9.

An apparatus as disclosed in one or more of claims 1-6, characterised in that a trough is attached either directly or indirectly to the framework of the reverse vending apparatus  
30 as said container catch means, and that said guiding means is arranged to sweep across the surface of the trough when the drum rotates in order to move the container out of the trough and down into one of the receptacles.

10.

35 An apparatus as disclosed in claim 7, for additionally destroying received containers, characterised in that a destruction device, e.g., a compactor, is positioned adjacent to a side face of the container sorting wall.

11.

An apparatus as disclosed in claim 1, characterised in that the detecting means comprises an identification code reader, e.g., a bar code reader.

5

12.

An apparatus as disclosed in claim 11, characterised in that the code reader is arranged to read an identification code on the container during a limited rotary motion of the drum.

10

13.

An apparatus as disclosed in claim 12, characterised in that the rotary motion of the drum is through an angle in the range of  $20^{\circ}$ - $120^{\circ}$ , preferably about  $45^{\circ}$ - $75^{\circ}$ .

15

14.

An apparatus as disclosed in claim 1, characterised in that the detecting means comprises a material detector.

15.

20 An apparatus as disclosed in claim 14, characterised in that the material detector is a metal-type detector.

16.

25 An apparatus as disclosed in claim 1, characterised in that the detecting means comprises a weighing instrument.

17.

30 An apparatus as disclosed in claim 16, characterised in that the weighing instrument is made in the form of a pressure-sensitive sensor positioned at an end wall of the receiving and holding unit, and that the end wall forms a pressure plate for the sensor.

18.

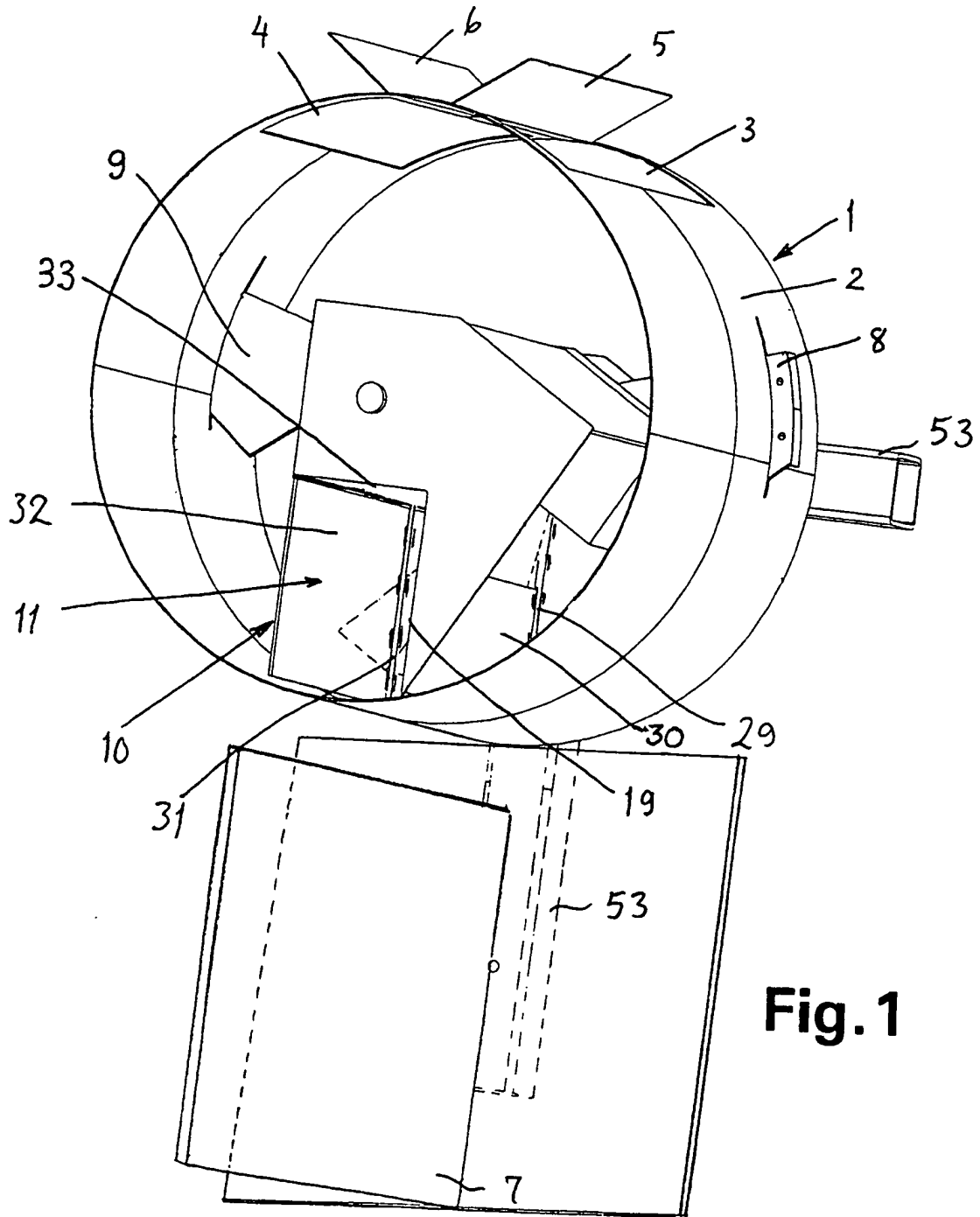
35 An apparatus as disclosed in one or more of the preceding claims, characterised in that the drum wall is equipped with a container return opening covered by a flap, the flap being provided with a means for actuating the opening thereof when a container is to be returned to the user or customer.

19.

An apparatus as disclosed in claim 18, characterised in that when a container is to be returned to the user or customer, the opening and its flap are in a lower position immediately beneath the receiving and holding unit, and the flap in its open position  
5 forms a chute for a container which is to be returned to the user or customer.

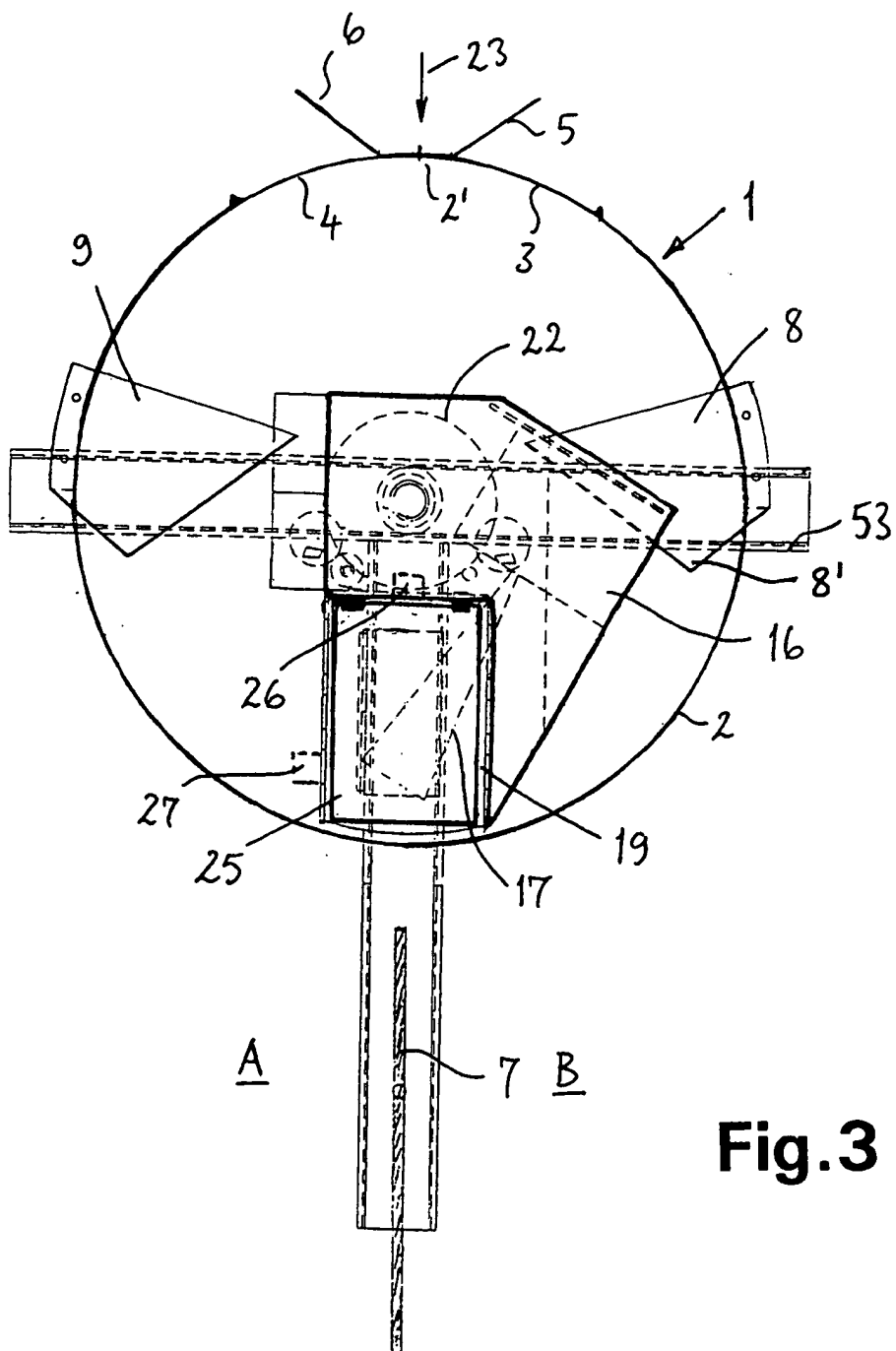
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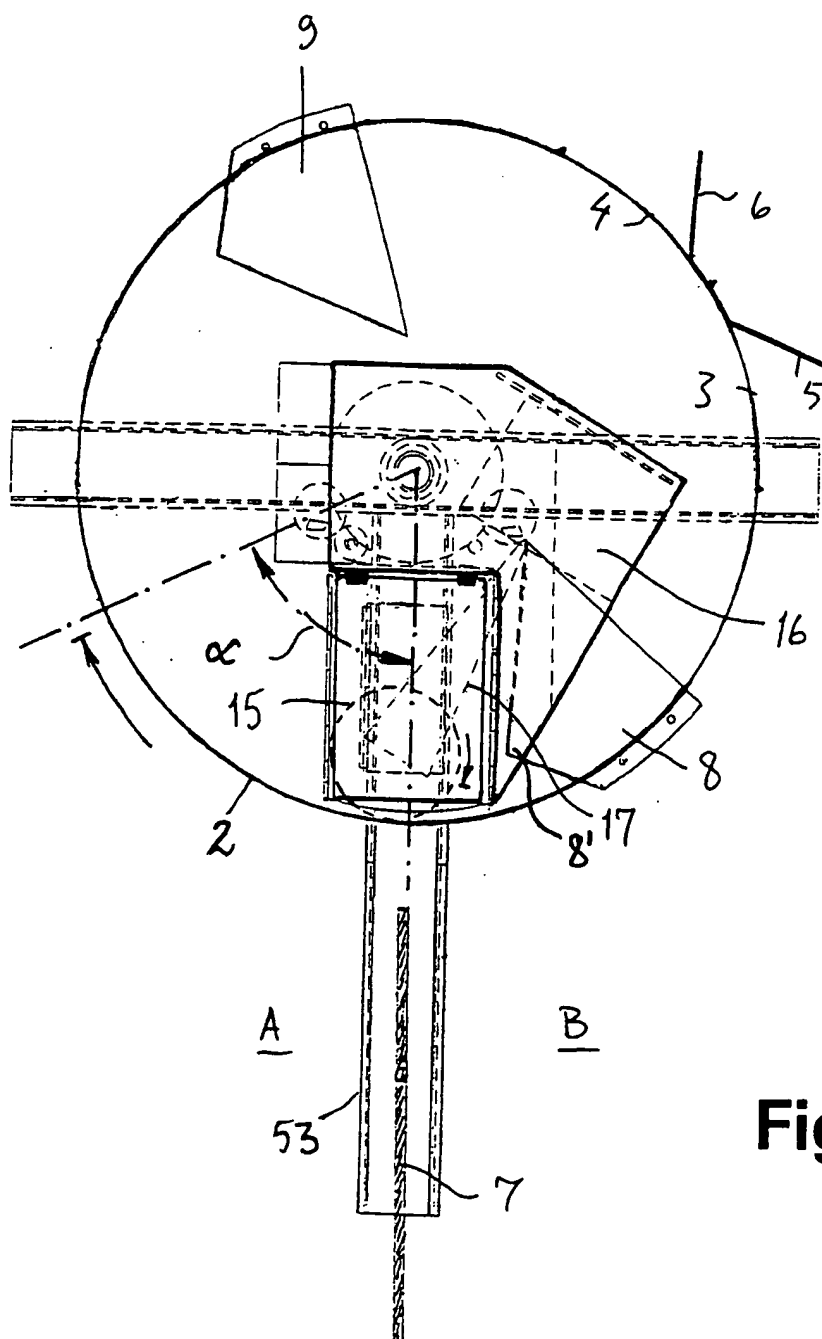
An apparatus as disclosed in claim 18 and 19, characterised in that the flap is spring-loaded, and that said means consists of a projected, angular portion at the rear edge of  
10 the flap and a pusher mechanism which can be brought into engagement with said portion.



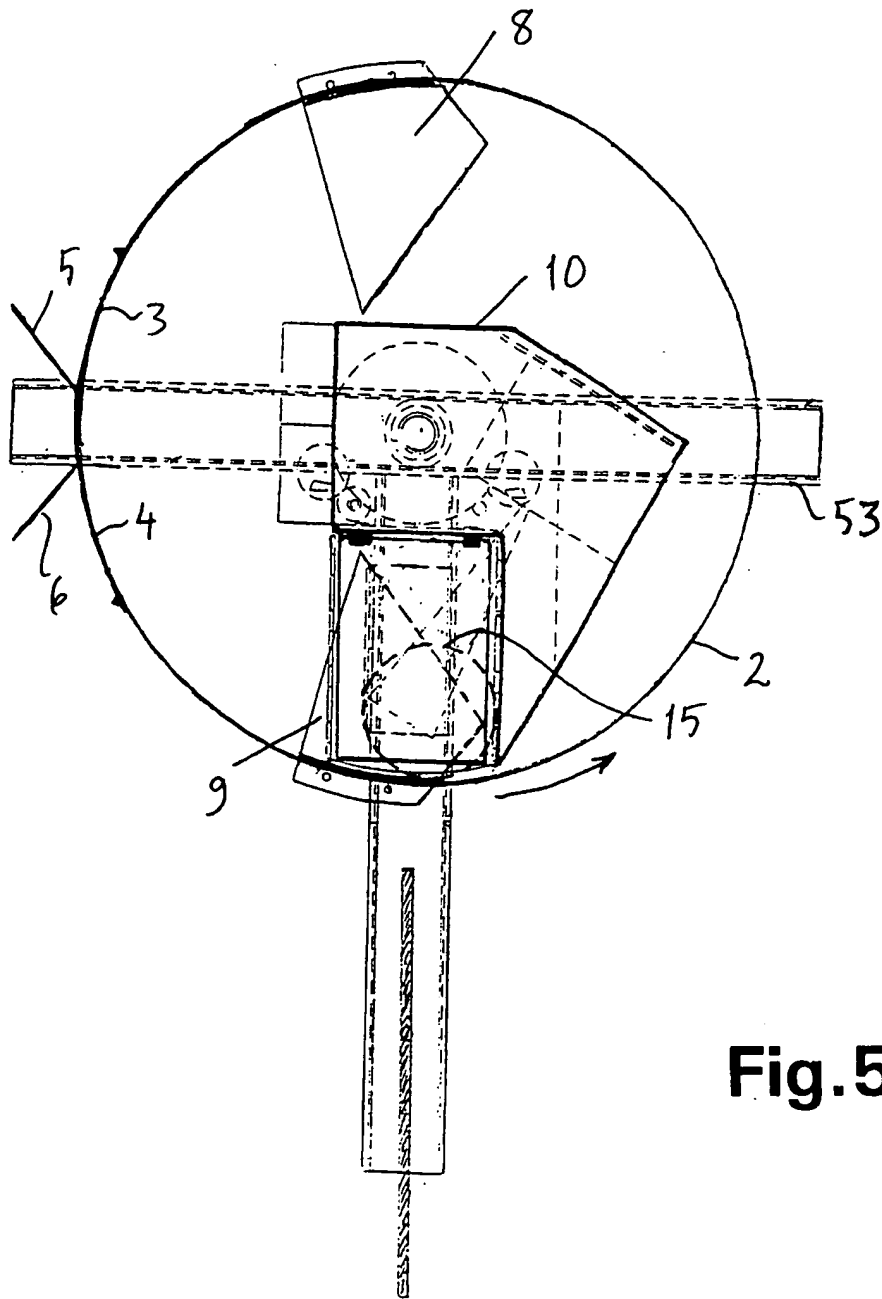


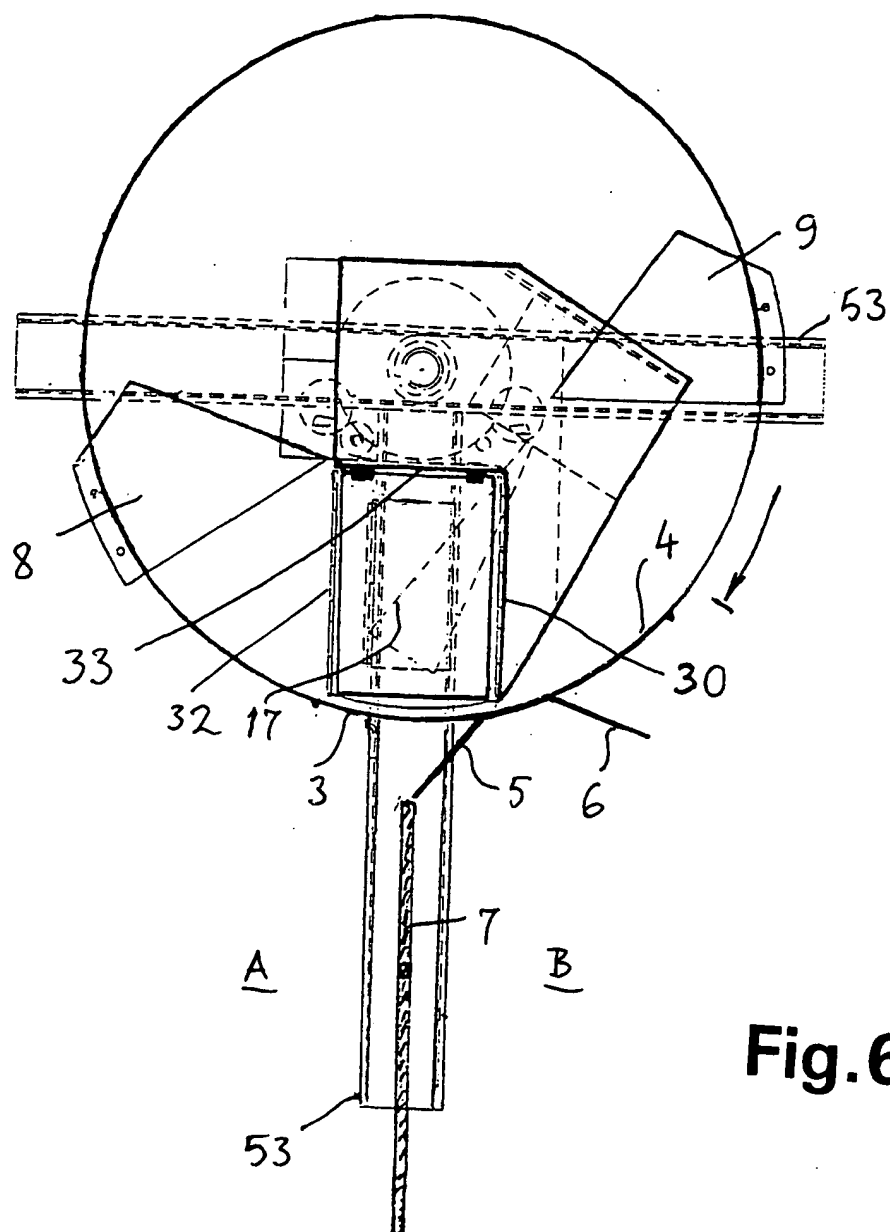


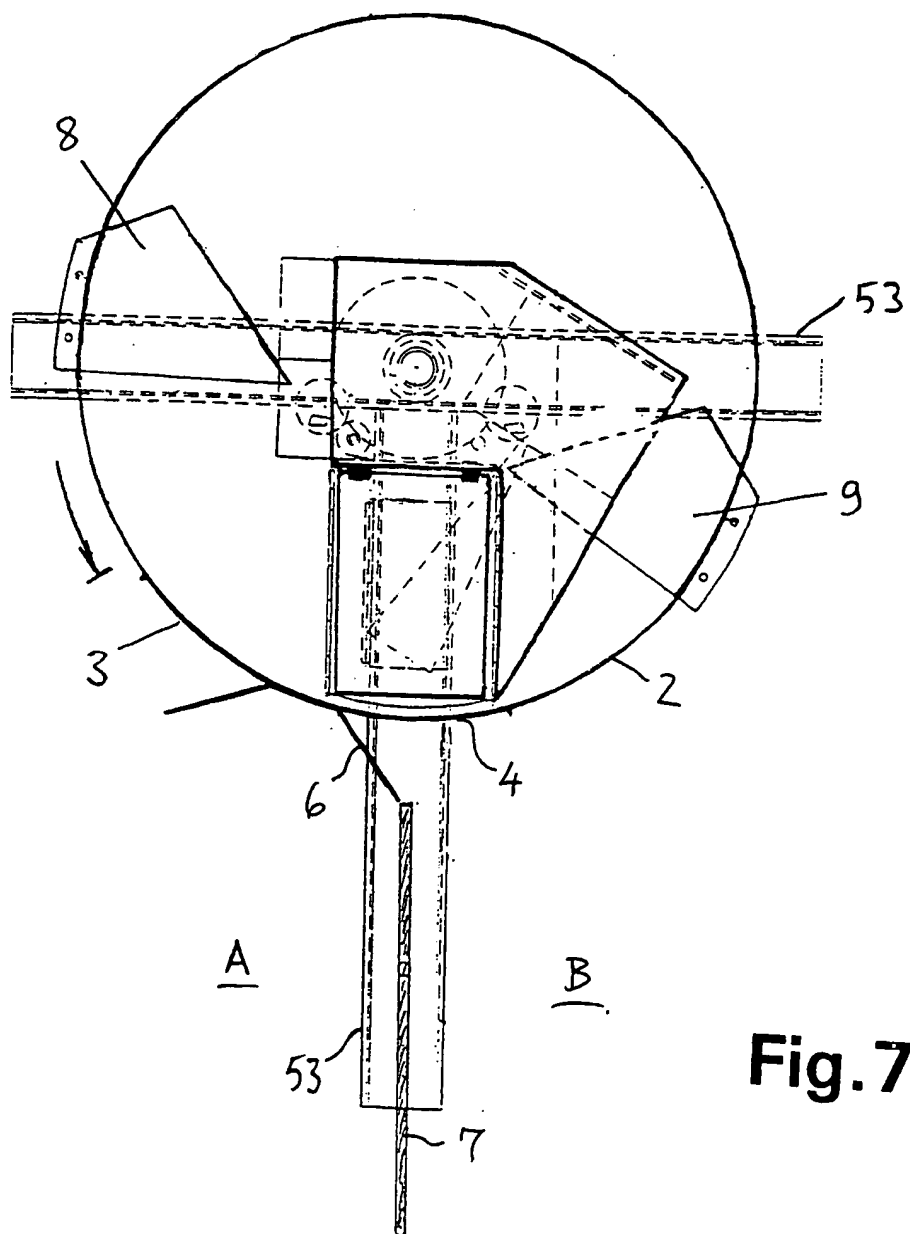


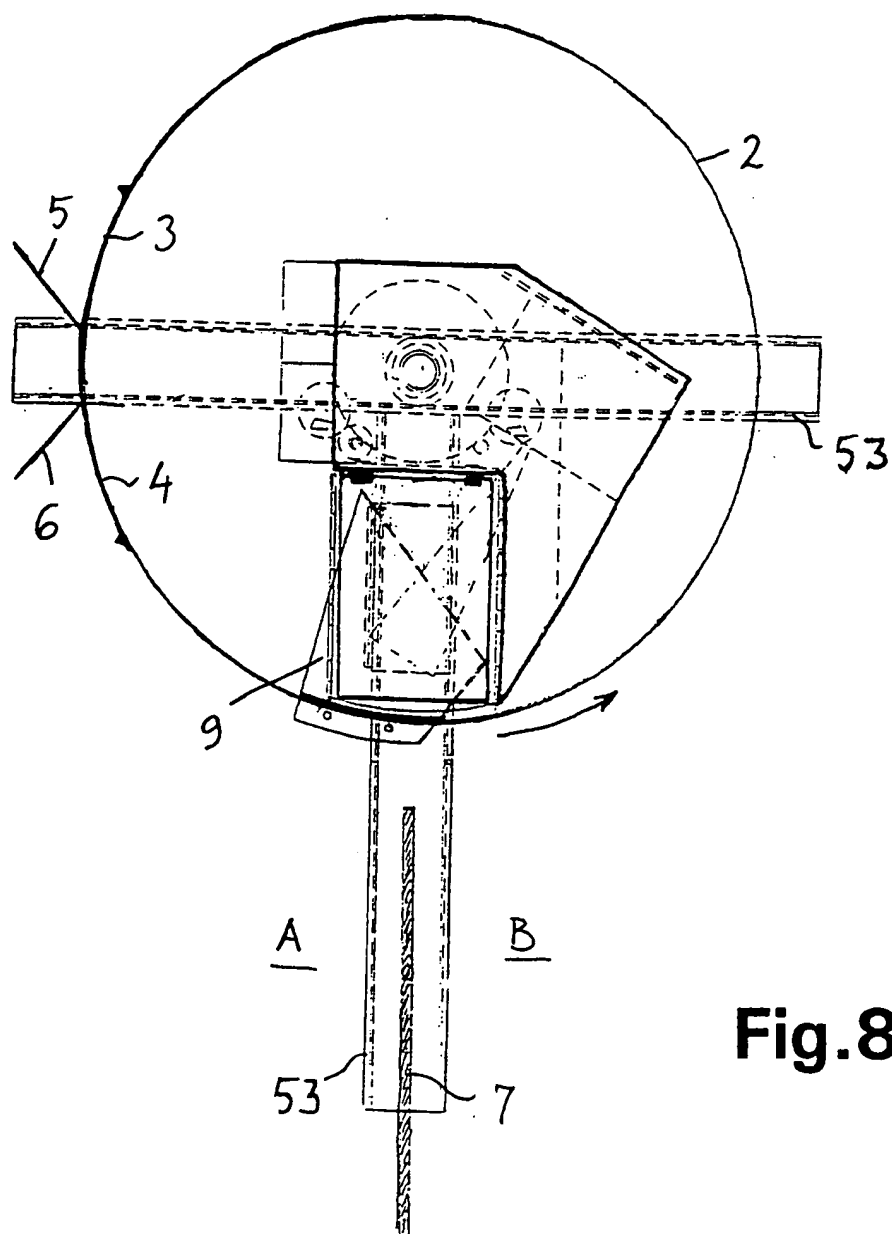


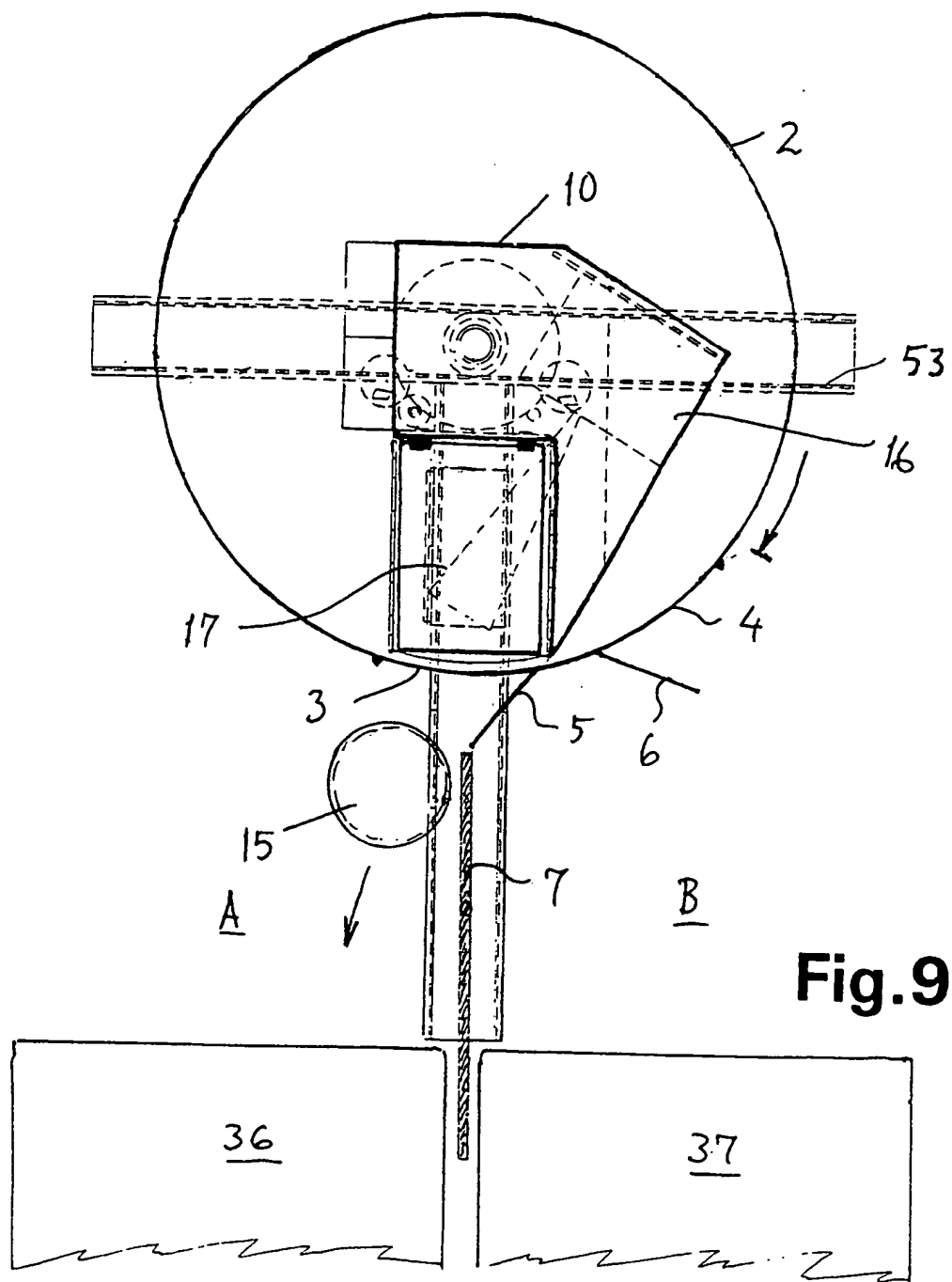
**Fig.4**

**Fig.5**

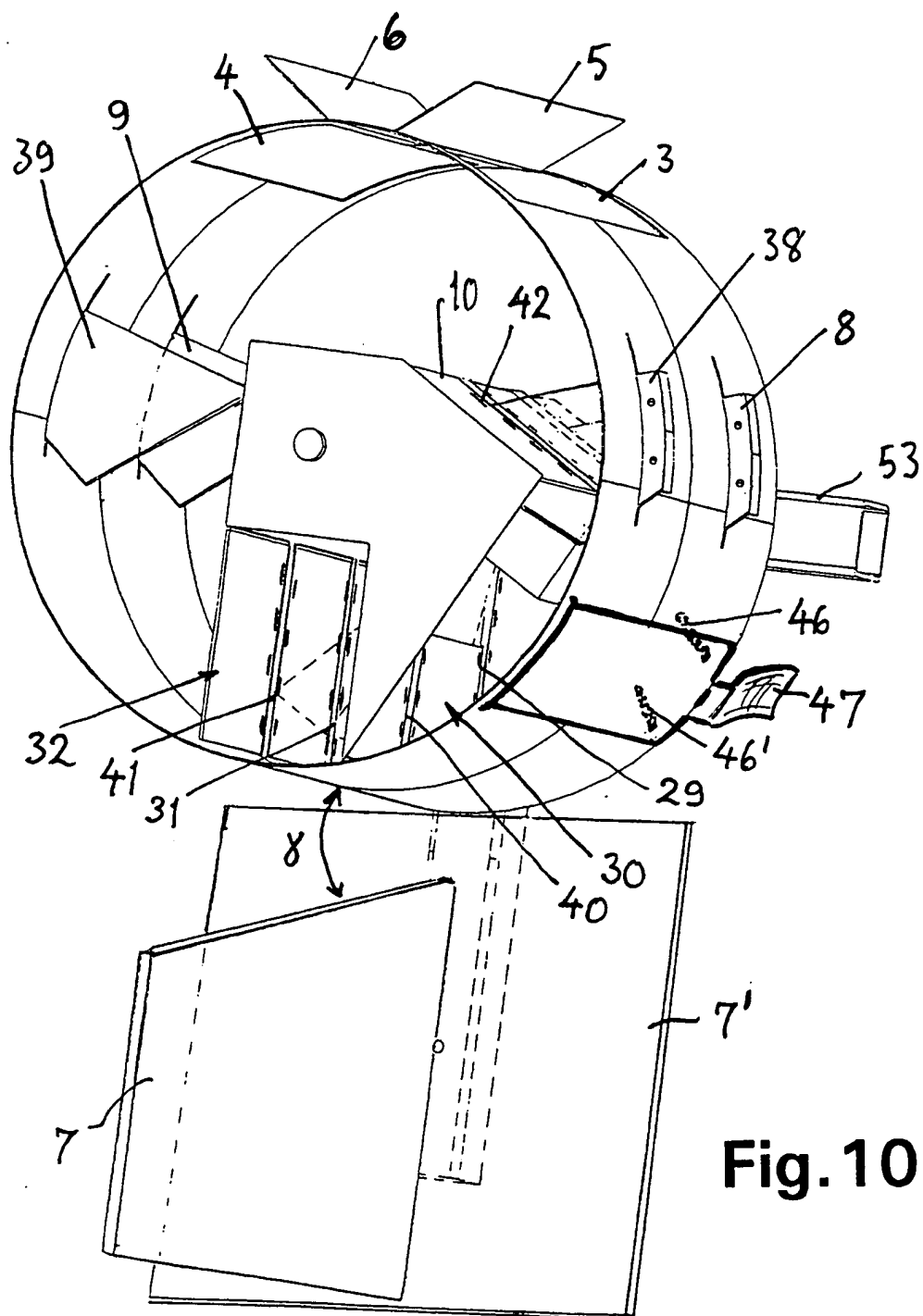


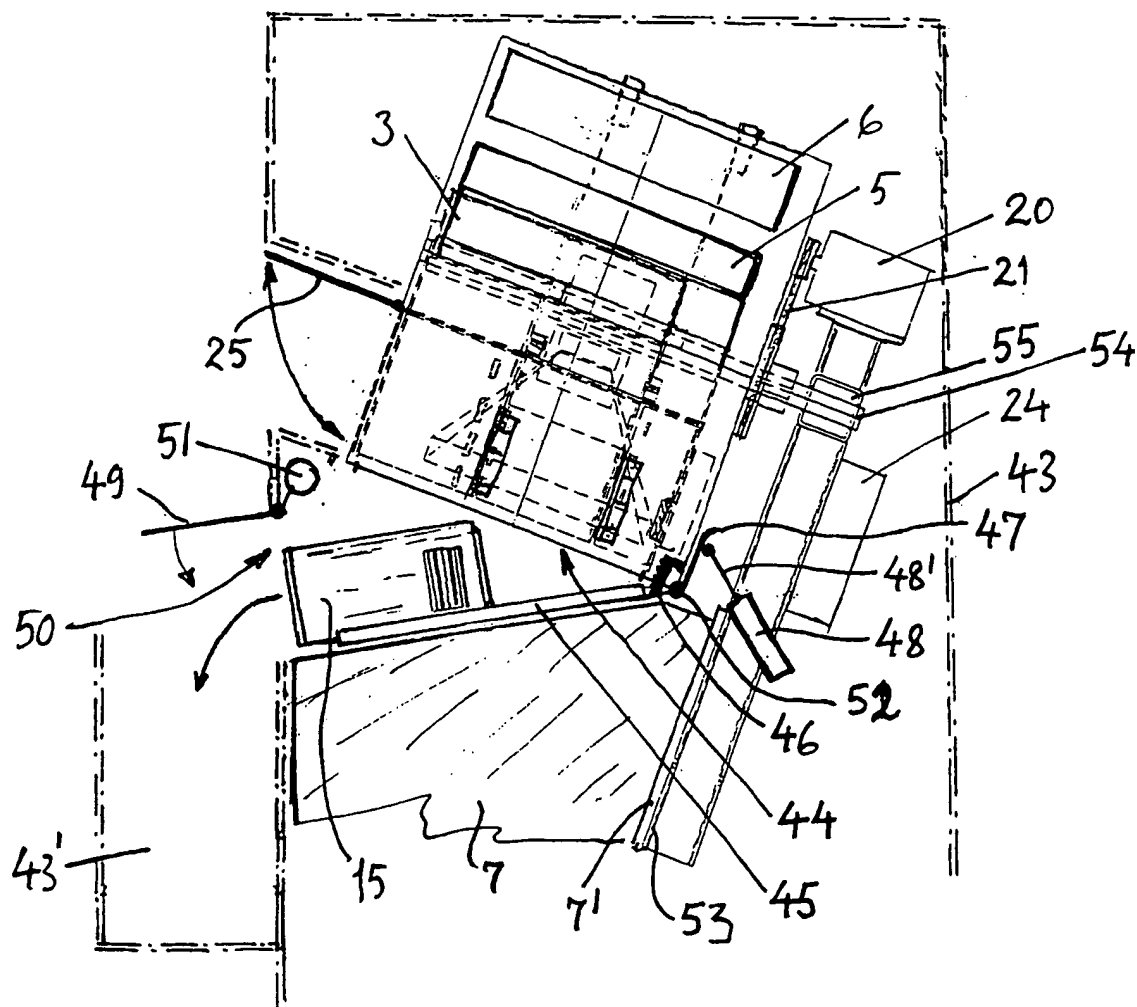
**Fig. 7**

**Fig. 8**

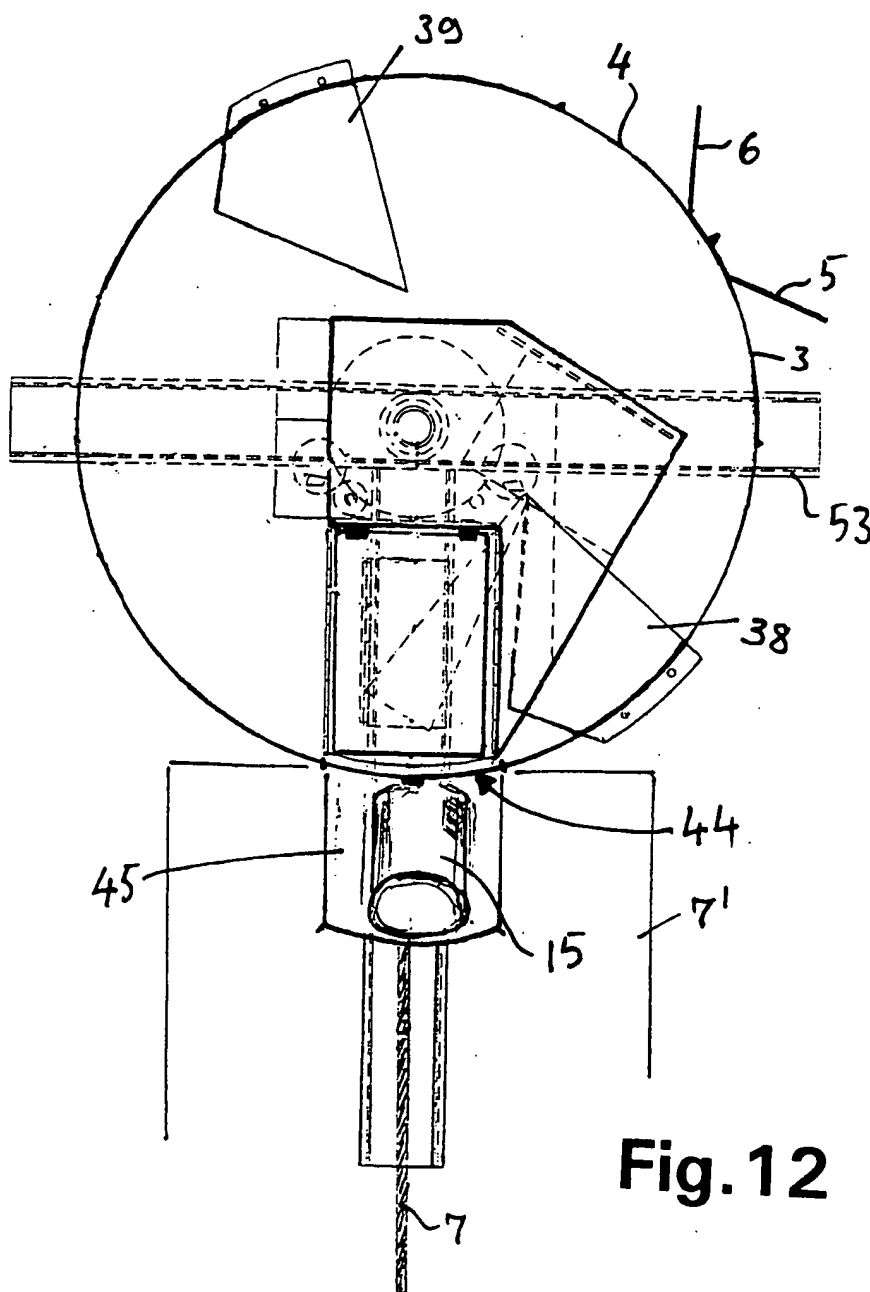


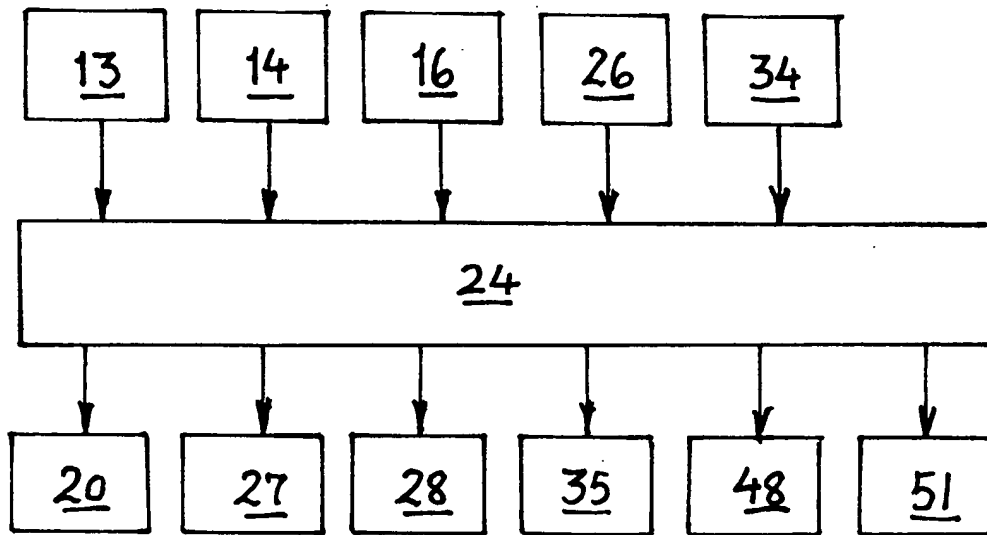


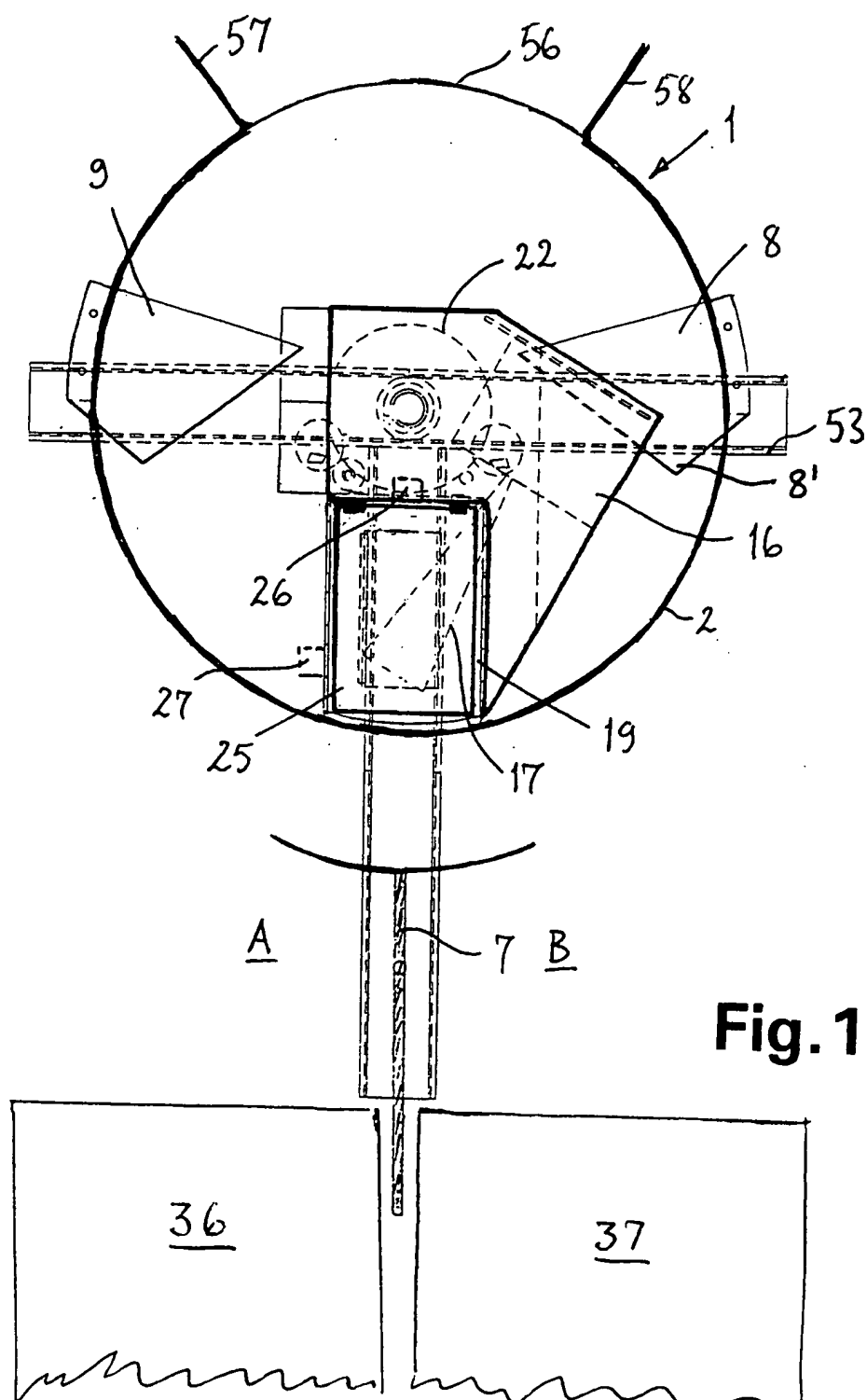


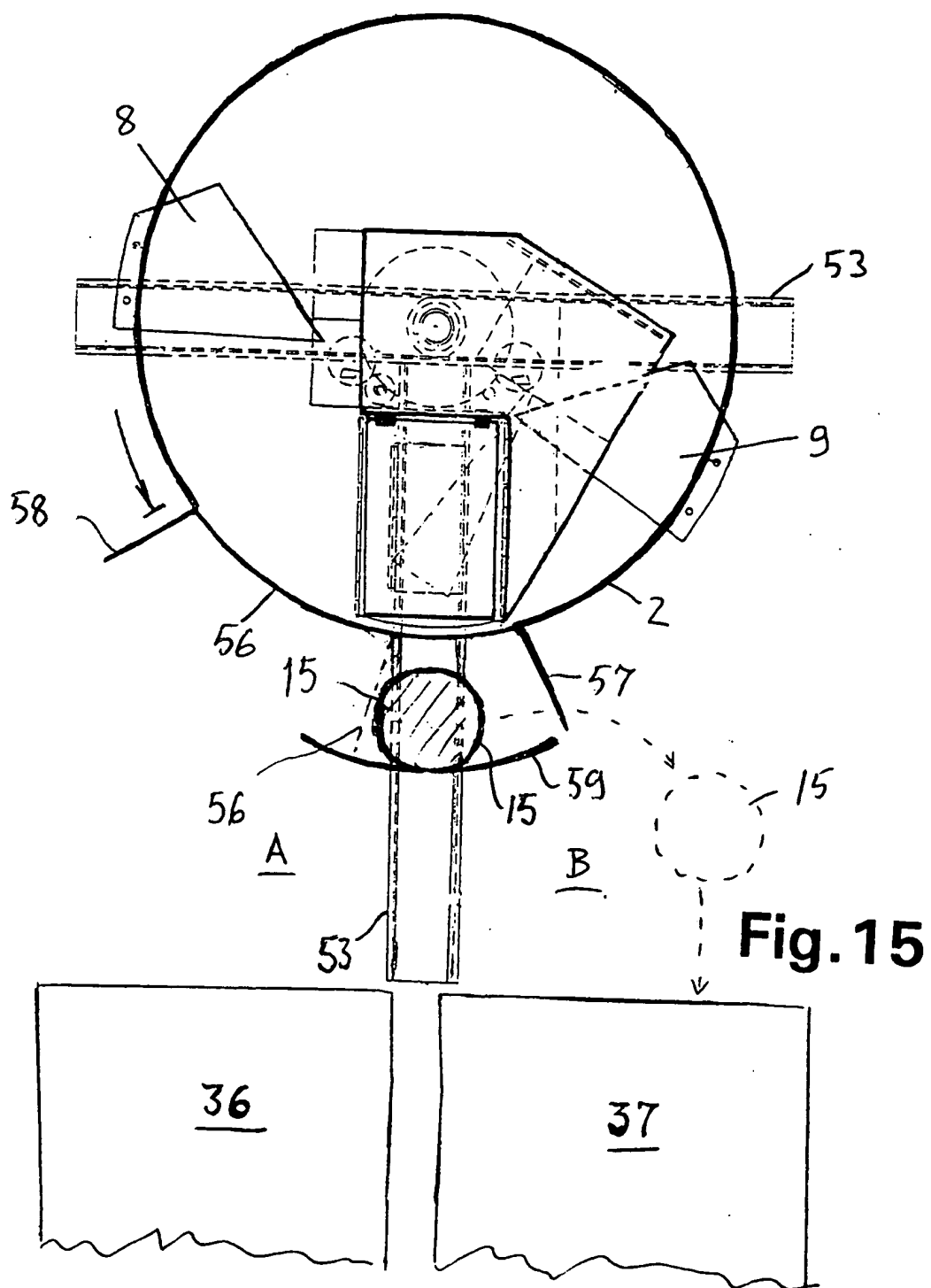


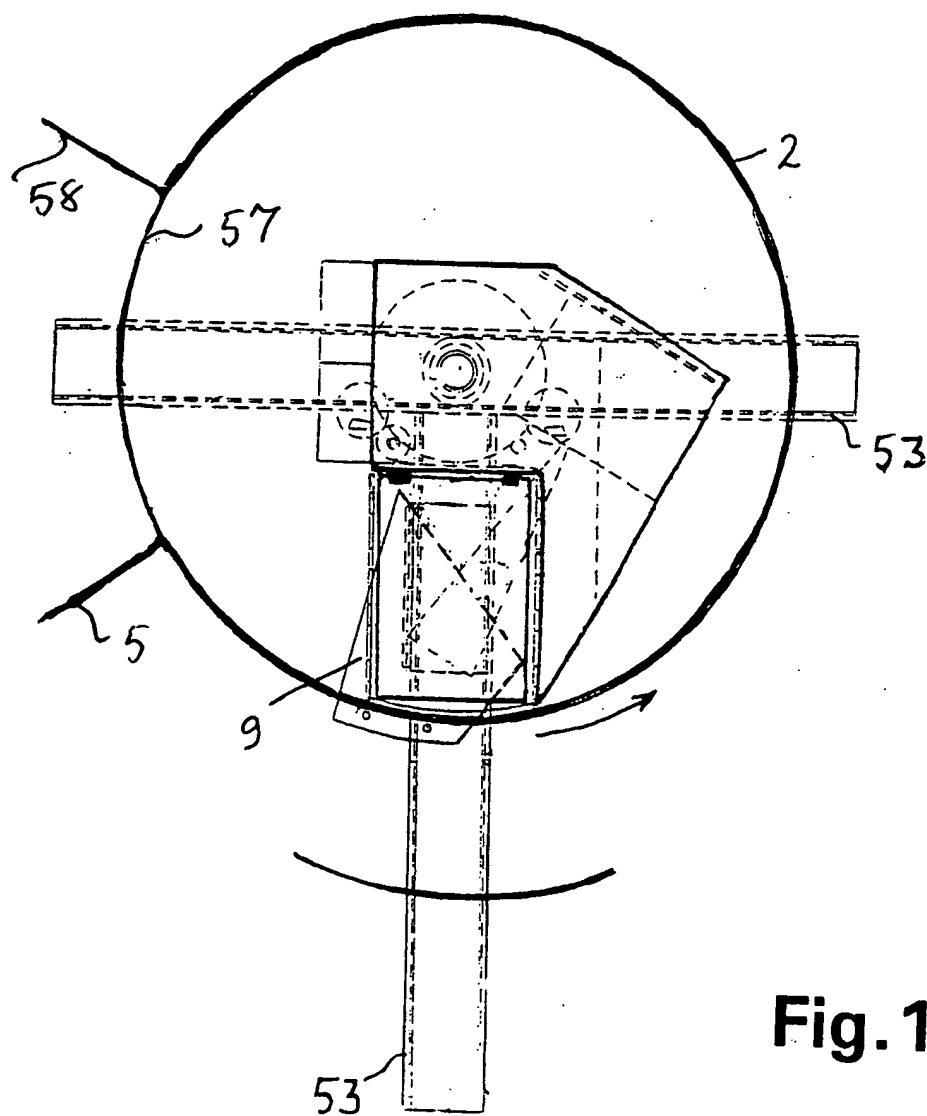
**Fig. 11**

**Fig. 12**

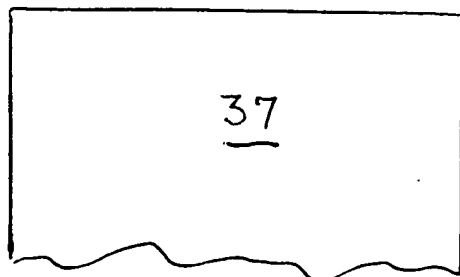
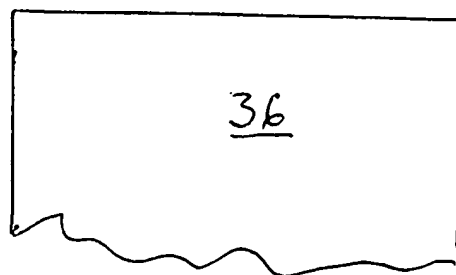
**Fig.13**

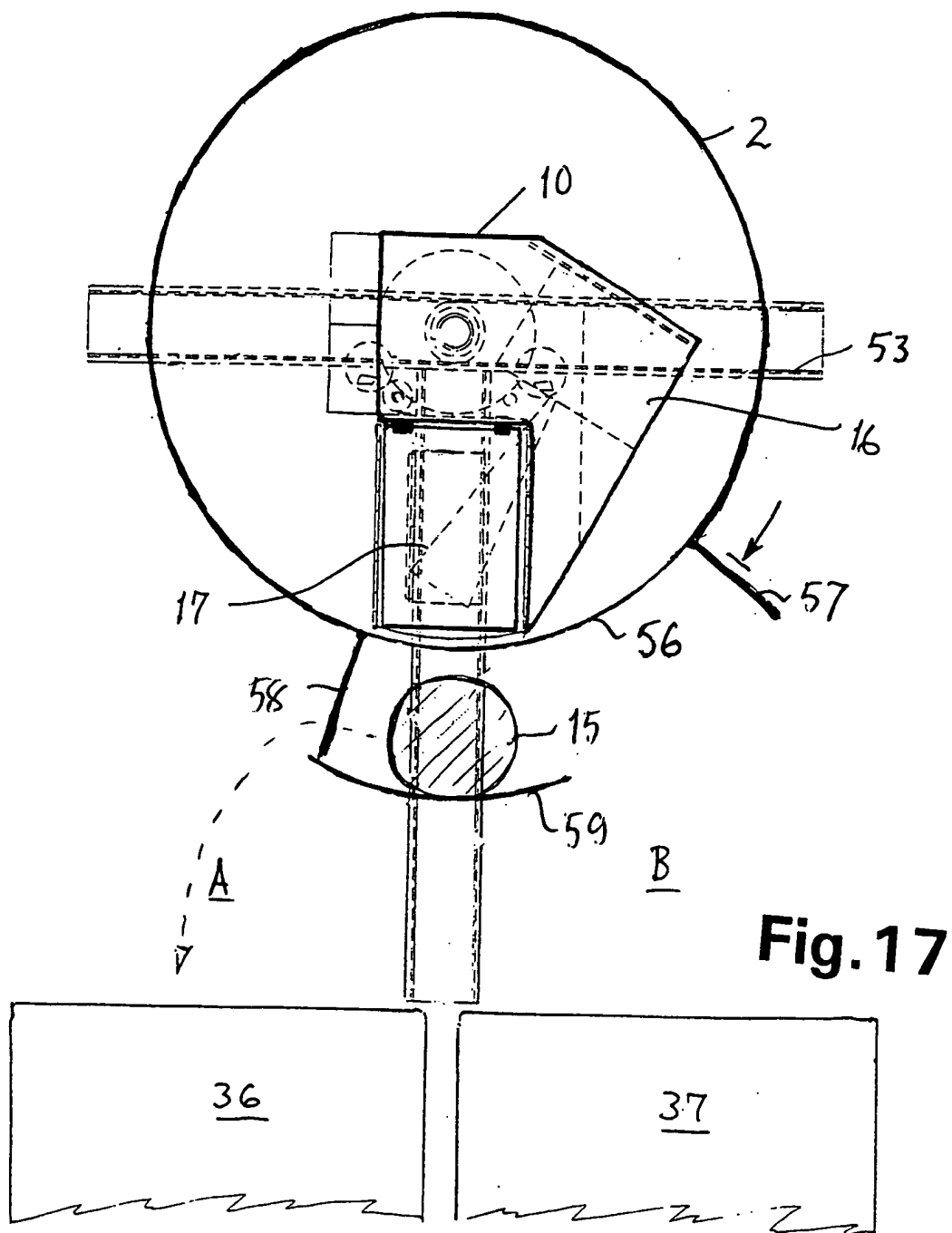
**Fig. 14**





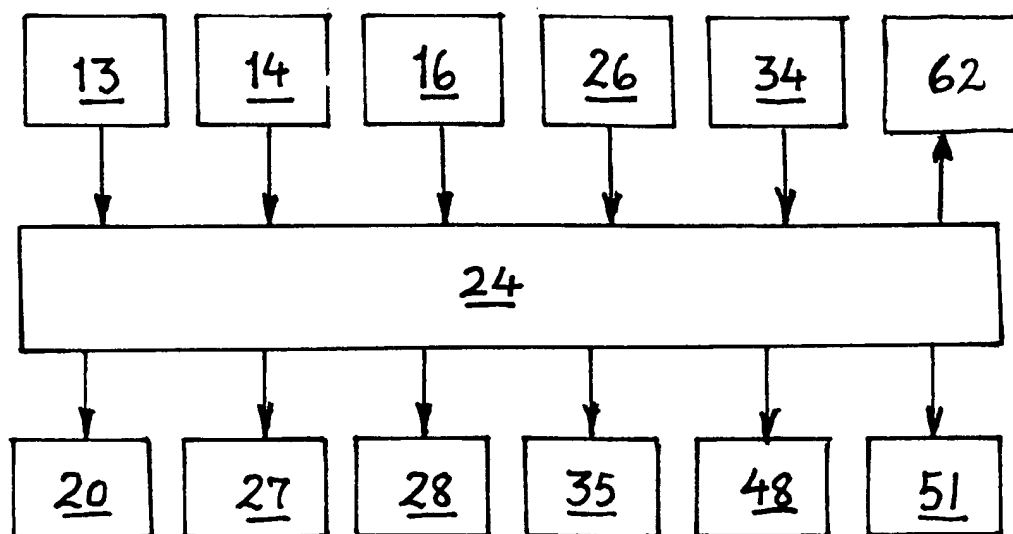
**Fig. 16**









**Fig.19**

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/NO 98/00345

## A. CLASSIFICATION OF SUBJECT MATTER

IPC6: G07F 7/06

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: G07F, B07C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EDOC, WPI, JAPIO

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 9325981 A1 (TOMRA SYSTEMS A/S), 23 December 1993 (23.12.93), page 3, line 26 - line 30; page 4, line 32, figure 3 --	1-20
A	US 4454028 A (VETTER ET AL), 12 June 1984 (12.06.84) --	
A	US 5090031 A (PYNE ET AL), 18 February 1992 (18.02.92) -- -----	

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

## \* Special categories of cited documents:

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Date of the actual completion of the international search

2 March 1999

Date of mailing of the international search report

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## INTERNATIONAL SEARCH REPORT

Information on patent family members

02/02/99

International application No.

PCT/NO 98/00345

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9325981 A1	23/12/93	AU 4360493 A DE 4392703 T JP 7507890 T US 5248102 A	04/01/94 11/05/95 31/08/95 28/09/93
US 4454028 A	12/06/84	NONE	
US 5090031 A	18/02/92	NONE	